10 Rec'd PCT/PTO 01 OCT 1999
09/142712

A Method of Rotting Compostable Material[1]

The present invention relates to a method according to the overriding concept of claim 1.

Such a method should be generally well known. In such methods, the materials to be composted are first reduced in size, and, in a quasi-stationary process, conducted to a mixing drum, where the materials to be rotted are to be digested microbially, in order, then, to store the partially digested materials in ricks[2].

Accordingly, the present method is distinguished from the known methods of household composting by virtue of the fact that the method is undertaken, in a purposeful way, in a quasi-stationary throughput process in combination with the characteristics of prior shredding and preliminary rotting in a mixing drum.

The prior decaying in an enclosed mixing drum is undertaken, to good advantage, at temperatures that clearly exceed the ambient temperature. This fosters the speed of the preliminary decaying reaction.

And yet, it has been shown that with the known method, the decaying times are still relatively long.

Therefore, it is the task of the invention to extend the known method in such a way that the decaying times are shortened by measures of process technology.

The invention performs this task with the characteristics of claim 1.

The reduced decaying times result from the better mixing through of the interim products, and from the anaerobic pre-treatment and subsequent treatment, respectively. In a special extension, a partial flow of pre-rotted material is, in addition, subjected to subsequent anaerobic treatment before the partial flow, which has undergone subsequent treatment of this type, is led, once more, to a stage in the method. It is possible to affect the nitrogen content by means of anaerobic denitrification, before the stage, and/or after it.

The invention results in the advantage that the micro-organisms that developed in the course of the process are removed at the end of a pre-determined processing stage in each case,

[1] Translator's Note: "CONFIRMATION COPY" appears at the bottom of the page.
[2] Translator's Note: Also means silos, stacks.

and are led back to the beginning of the processing stage, in question, so that by these means, the micro-organisms that are particularly active at all times, are available, even at the beginning of each and every stage in the process, to digest the material to be composted with corresponding speed.

This advantage is achieved by virtue of the fact that the material, at the beginning of each and every processing stage, is brought into contact with the material that is available at the end of this processing stage and is thoroughly mixed in a substantially homogeneous manner.

In this way, the microorganisms that are led back can be used once more to digest the initial material of the process stage.

An exponential proliferation of the microorganisms in question may be expected accordingly, from which, once again, an accelerated decaying process results.

In the process, it is assumed that the individual growth rate of the microorganisms also depends upon the nutritional offerings. The nutritional offerings should be greatest in the area of the initial material of a processing stage because the micro-organisms that are responsible for this processing stage have not yet been able to undertake any intensive breakdown of the nutritive material there.

In the process, especially at the beginning of the processing through-put, the entire product can be led back in order to achieve an accelerated increase of the rate of processing, up to the highest possible speed.

If one considers, furthermore, that certain processing stages cause certain stages of decay, these stages of decay are achieved more quickly by the cascade-like return of the material in each case.

Accordingly, within a shorter processing period as well, it is possible to count on an increased proportion of process-specific intermediate products.

The result of this, for the processing stage that follows, in each case, is an increased saturation of its end products within a correspondingly shorter span of time.

And yet, here, too, once again, the material can be led back in order to achieve an exponential rate of reaction here as well.

In the process, particular attention is paid to leading the interim products back at the end of the mixing drum because in the mixing drum, the bio-chemical reactive processes proceed in many instances to a high degree and in an intensive manner.

The processes that occur within the mixing drum are exothermal so that as the material is led back, the processing temperature at the beginning of the mixing drum can be increased accordingly.

The result of this, once again, is a reduction of the decaying times in the mixing drum and of any subsequent stages that might follow.

In a special extension, a subsequent aerobic treatment is provided, at least in part, to a partial flow behind the mixing drum. To do this, the micro-organisms of the pre-decayed material undergo as thorough a mixing as possible in a reactor vessel while air is introduced, in order to prepare the micro-organisms that are required for the decay, by means of process technology, for their use in a preceding stage of the process.

To do this, it is suggested that the thorough mixing be accomplished in a self-contained loop of flow that should be enclosed within the reactor vessel, one that is, preferably, vertical. In addition, the subsequent aerobic treatment can occur as physically prepared water, preferably, is introduced. To this end, it is suggested that the water be prepared in a manner that is friendly to microbes. This will be dealt with in detail in what follows. It proved to be extraordinarily effective if the partial flow for the subsequent aerobic treatment is separated, initially, into a flow of solids, and a cloudy water flow. In this case, it must be assumed that the micro-organisms that are to undergo preparation are swimming, for the most part, in the flow of cloudy water, which can, from the standpoint of process technology, be subjected to subsequent aerobic treatment by relatively simple means.

What is at stake, accordingly, is a sub-case of pre-rotted material of the subsequent treatment per se, in which, as a result of the separation of the microbially saturated cloudy water, a further specification of this treatment stage occurs.

Advantageous extensions of the invention result from the subsidiary claims.

Particular significance is attached to the characteristics of claim 16 in the process.

As a result of these measures, indeed, on the one hand, without any further ado, fresh water, untreated water, or wastewater can be used to accelerate the process; on the other hand, an embodiment example for an apparatus is given, by means of which the tapwater is affected only for the requisite processing duration, accordingly.

In what follows, the invention is elucidated in greater detail by virtue of embodiment examples.

Fig. 1 shows, schematically, a facility for implementing the process according to this invention,

Fig. 2 shows a device for processing water in a manner that is friendly to microbes, in longitudinal section.

Fig. 3 shows a view according to Fig. 2, along the line III-III,

Fig. 4 shows a mixing blade for the rotating drum, and

Fig. 5 shows a portion of the facility for the subsequent aerobic treatment of a pre-rotted partial flow.

Fig. 6 shows the total principle of a facility with additional subsequent denitrification and a bio-stage reactor according to Fig. 5.

Figs. 7a, b show embodiment examples for suitable mixing drums,

Fig. 8 shows additional embodiment examples for processing water.[3]

To the extent that nothing to the contrary is said in what follows, the following description applies to all figures, in all cases.

A conceivable facility for implementing the process according to the present invention consists of a shredder, 1, in which the material to be composted is initially reduced in size to pieces of substantially uniform size.

After the material has been shredded, it can be conducted to the preliminary product mixer, 2, where, if necessary, aerobic or anaerobic preliminary products may be added to the mixture. For this purpose, the preliminary product mixer, 2, exhibits a mixing shaft, 3, that stands vertically, which is connected with mixing blades 4 that sit upon it so as to resist rotation. Due to a propulsion unit that is not depicted, the mixing shaft, 3, is set in rotary motion so as to thoroughly mix the freshly-shredded material with the preliminary products in as homogeneous a manner as possible.

From the preliminary product mixer, 2, following this processing stage, a partial flow of this material is branched off and led to the anaerobic denitrification container 5 via preliminary denitrification line 29. There, as the name implies, the partially branched off material of the preliminary product mixer, 2, is denitrified, to return it then, once again as a partial flow, to the preliminary products.

[3]Translator's Note: No Figures were included with the document.

In this way, following combination once again, a predetermined proportion of nitrogen is produced in the shredded material before it is placed into mixing drum 6.

Thus, even here, a partially digested compost material with a predetermined proportion of nitrogen may be expected, which is now processed further in mixing drum 6. In the case of Fig. 1, the mixing drum may be turned around an axis with a horizontal component. The thorough mixing is accomplished by means of mixing blades that sit rigidly on mixing drum 10. A mixing drum of this type will be referred to as a rotating drum in what follows. For mixing drums of other embodiments (see Figs. 7a, b) the following applies, accordingly, with the proviso that instead of the concept "rotating drum," the concept "mixing drum" will be used.

Rotating drum 6 is supported on stationary bearings, 7, and, by means of a suitable propulsion system, it is capable of turning, together with the material found within it, around the longitudinal axis, which lies horizontally.

The drum itself is embodied as a straight, hollow, cylindrical drum, and at both its ends, it is closed by means of covers. At input end 8, a central opening serves the continual inputting of the material to be composted, material which has been prepared with the pre-determined nitrogen content.

As a result of the central opening at input end 8, the material can be introduced, without interruption, into rotating drum 6, where it collects, practically uniformly, in the lower area of rotating drum 6. During rotation, the mixing blades, 10, which are rigidly connected to the wall of the rotating drum, 45 (see Fig. 4), constantly move through the collection of the material to be composted, which has collected in the lower area of the drum, and they assure, by way of the horizontal position of the drum, a quality that is as homogeneous as possible.

The microbiological-chemical reactions within rotating drum 6 assure a temperature there that is on the order of about 80°C.

A spray unit, which is fed by way of the water conditioning facility, 33, serves to assure the requisite moisture. This will be addressed later.

At the removal end, 9, of the drum, a cover may be applied, for example, which is perforated by one or more openings in the area of its outer edge. In the process, these perforations move again and again through the area in which the material to be composted collects and they scrape past it.

Due to the fact that the input of the material to be composted occurs practically continually, previously digested composting material will escape by way of the passing perforations on removal end 9 of rotating drum 6, material which is then conducted to the return conveyor 11.

To this end, the return conveyor, 11, is equipped with a spiral conveyor, 12, which conveys the material to be led back to the beginning of the "rotating drum" processing stage. There, the material that was removed at the end of the "rotating drum" processing stage is combined with the material from the preliminary product mixer, 2. In the process, the nutrients that are contained within the material from the preliminary product mixer, 2, are particularly greedily accepted by the microbes of the material that originates from the end of this processing stage because the terminal material is already nutrient-poor in this regard.

What happens in this way is that within the shortest period of time, the freshly-added material is digested, and can be transformed by the microbes.

In the process, the return spiral conveyor, 12, can be continually driven if the return conveyor 11 is seated on bearings in suitable fashion, so as to be capable of rotation relative to removal end, 9.

As a consequence of the elevated temperature within drum 6, provision can also be made for the heat contained within the material that has been taken out to be removed in a heat exchanger, 13, and for it to be conducted back into the process.

The air that is warmed up for this purpose can, on the one hand, be led back, by way of a thermal return line 15, to the input end, 8, of rotating drum 6; on the other hand, however, it is also possible to conduct this heat to a post-ventilator, 27, which then uses the warm air to keep the crude composter, 23, warm.

In the process, especially by means of the quantitative ratio of the air currents to the preliminary ventilator, 28, and to the post-ventilator, 27, it is possible to achieve a certain condition in terms of temperature. Therefore, an optimization of the ratio of the rotating drum temperature and the crude composting temperature is possible as well.

The temperature ratio is adjusted by way of the quantitative ratio of the air currents in the waste heat line 14 and in the thermal return line 15.

The partial flow, which is not removed at the end of rotating drum, 6, is then led to a coarse sieve, 16, which coarse sieve, 16, may be followed by a fine sieve, 17.

Furthermore, an additional partial flow can be removed at the end of the rotating drum 6 and be led to the preliminary product mixer 2.

This affords the advantage that even largely digested material is thoroughly mixed with the freshly shredded material to form a homogeneous blend. It holds true here, as well, that the microbes that are present at the end of the "rotating drum" processing stage proceed, in an extremely active manner, to break down the shredded material, which is still very rich in nutrients.

At the end of the course of sieves, 16, 17, material that has already been finely sifted is available.

The coarse pieces that are retained by the sieves can be led to a grinder, 18, where they are ground once more.

The ground material can then, by means of the grinder return line, 50, be introduced to good purpose into the process immediately behind the shredder, 1, once more, so that practically no residual substances of any kind remain from the process.

The sieve cascade, 16, 17 is topped by an anaerobe container. For this purpose, it is suggested that material that has already been partially digested and has been finely sifted be subjected to a sojourn period of between about three and thirty days, in order to activate the breakdown process.

An anaerobe material return line, 21, leads back from the anaerobe container, 19, in order to make it possible to conduct even the material of this processing stage to a preceding stage of the process once again. If necessary, the material, which has undergone prior anaerobic treatment, can be brought together with the material from the rotating drum in the drum material return line, and it can be led to the preliminary product mixer, 2.

The anaerobically pre-treated material from the anaerobe container, 19, which was not led back as a partial flow, can then be given to the crude composter, 23. Here, too, there exists the possibility to provide a crude compost material return by way of line 22. To accelerate the crude composting, the post-ventilator can blow air that has been pre-heated accordingly by way of the waste heat line, 14, into the crude compost. Viewed globally, what is at issue is a return of anaerobic material.

From the crude composter, the material is then led to a container for the purpose of post-denitrification, 24. For this purpose, it is recommended, in particular, that worm cultures, 25, be

used, because such worm cultures lead to an increased nitrate breakdown in the compost material.

Overall, thus, provision is made for denitrification by way of the pre-denitrification container, 5, by way of the topped anaerobe container 19, and by way of post-denitrification by means of suitable worm cultures.

In the topped anaerobe container, in particular, increased break-down of noxious substances can occur as a result of the sojourn time for which provision is made, a period between 2 and 30 days.

In addition, provision can be made that not all material be led by way of the topped anaerobe container 19, but only a partial flow.

At the outlet of this anaerobe container, by way of the enrichment line, 26, material that has already undergone increased breakdown of noxae can be mixed together with the initial material, and together with the latter, be given to the crude compost.

It has proven to be to good purpose that microbe-friendly prepared water be conducted to the throughput process ahead of or in the rotating drum, 6.

A water conditioning facility, 33, serves this purpose. This water conditioning facility can be connected to a water container, 30 - for example, the municipal water supply network, as well as with a mixing fluid container, 31. The fluids are conducted by way of valves that are not designated in any greater detail, to a pump, 32, which is, in turn, connected to the water conditioning facility, 33.

The ratio of fluids can be adjusted, according to the need of basic nutritive substances (N, O, P, S). The mixing fluid can, for example, be liquid manure, which contains high quantities of nitrates, or whey in proportions between zero % and 100%, particularly those substances with a great need (biological or chemical) for oxygen.

In any case, the mixing fluid exhibits a sufficiency of organic substances so that collateral fermentation occurs in the rotating drum, 6. In principle, it can also be to good purpose to conduct the freshly shredded material to a washer, 34, to clean it.

The water that is needed for this purpose can then be kept essentially free of sludge and suspended particulates in the washwater subsequent preparation unit, 35. As a matter of principle, it is, indeed, worth recommending that the sludge and the suspended particulates then be returned to the process once more. However, should it then prove that an inadmissible

enrichment of heavy metals is present here, then these sludges and suspended particulates must be disposed of separately. Fig. 2 shows details that pertain to the water conditioning facility, 33. Such a water conditioning facility, 33, possesses a housing, 36, that is substantially a round cylinder. In a bottom segment of this housing, 36, entry bore holes, 37, are provided. The bore holes run at an inclination relative to the longitudinal axis of the cylindrical housing in such a manner that they come together, in convergent fashion in the direction of the entrance. Downstream from the entry bore holes, 37, an electromagnetic coil, 38, in the form of a ring, is provided, which exhibits, at its center, a corresponding core, 39. The core, 39, is electromagnetically insulated with respect to the housing, 36. Consequently, an annular gap, 41, arises between the ring-shaped electromagnetic coil, 38, and the core, 39. The points of impingement, 43, at which the entering water jets converge by way of the entry bore holes, 37, lie in this annular gap, 41.

This will be addressed in detail later.

Downstream from the points of impingement, 43, the housing is continued into an outflow channel, 40. There, the electromagnetic core, 39, ends as well.

Now, on a prescribed circumference of the bottom segment, there sit several entry bore holes, 37. The entry bore holes, 37, are inclined toward each other in such a way that two entrance bore holes, in each case allow a pair of water jets to enter the annular gap, 41, which then meet at the point of impingement, 43. The point of impingement, 43, lies, as Fig. 3 shows, in particular, outside any and every contact area with the electromagnetic coil, 38, or with the core, 39. And yet, a strong electromagnetic field is present here. This is enhanced by the fact that the core, 39, has a polygonal cross-section that is twisted, preferably in the longitudinal direction. If one joins the midpoint of the core with a radial, unlimited line that passes through an angle of the polygon, the point of impingement, 43, lies on its extension as well. The polygonal embodiment of the core thus assures concentricity of lines of the magnetic field, so that the water jets that appear there are exposed to this high intensity of field as well.

Although the physical properties in this regard are not fully clarified with respect to the water conditioning, it can be assumed that as a result of the atomization of the water jets in the area of the high strengths of the magnetic field, a crushing, and at the same time, a homogenization of the crystalline structures that are found in the water occurs.

The crushing of the crystalline structures does not, purposely, eliminate them. The crystalline structures are, however, reduced considerably in terms of size, thus fostering the bio-chemical digestion of the compost material that is permeated with this water.

After a certain time, however, the finely-dispersed crystalline structures regroup to form large crystalline structures, so that in this way, conditioned water can then be released into the environment once more without further ado.

Furthermore, Fig. 4 shows an embodiment example of a mixing blade, 10.

A mixing blade of this type is rigidly joined to the mantle, 45, of the rotating drum, and it exhibits a mixing surface, 47 that points toward the interior area of the drum. At mixing blade 46, on the same side as its end, a mixing hook is provided which points, substantially, in the axial direction of the rotating drum, 6. Therefore, the mixing hook assures thorough mixing in the direction of the circumference of the rotating drum, while the rather long area of the mixing blade, 10, exhibits a mixing surface, 47, that points radially toward the interior of the rotating drum. The mixing surface, 47, causes an axial displacement of the material that is to be mixed thoroughly, whereby by way of the helically shaped undercut area, 49, of mixing surface, 47, a certain dug up effect results.

Furthermore, Fig. 5 shows an extension of the invention.

There, an area of the facility may be seen that serves to provide subsequent aerobic treatment of a pre-decayed partial flow, 55. The pre-decayed partial flow is branched off behind the rotating drum or any other kind of suitable preliminary decaying, and is led to this area of the facility as partial flow 55. This area of the facility is also designated a bio-stage reactor.

After a subsequent aerobic treatment in the subsequent treatment facility 56, the partial flow that has undergone this treatment, 70, is conducted back to the rotating drum.

The centerpiece of the subsequent aerobic treatment facility, 56, is the reactor vessel, 59. The reactor vessel, 59, has an inner vertical tube, 60, in which a downward flow, 63, of the partial flow, which is to be treated anaerobically, is produced.

For reasons of continuity, the downward flow, 63, outside the inner vertical tube, 60, is diverted to an upward flow, 64. The result, thus, is a basically closed loop of flow, 61, within the reactor vessel 59; by these means, deep-seated thorough mixing of the corresponding partial flow with air, or with a mixture of air and water, can be accomplished. The introduction of the mixture of air and water is accomplished in the inner vertical tube, 60, by means of an aerobic

jet, 62, that is arranged in the downward flow, 63. There, a flow of air is conducted to a flow of water made of prepared water that is, preferably, friendly to microbes.

As a result of the self-contained closed loop of flow, 61, a high throughput mass is achieved at a high degree of mixing efficiency. Therefore, even in the case of this embodiment variant, the integration of a partial composting process with the processing stages for microbial water preparation into a single, stationary throughput process has succeeded.

The integration is accomplished, among other things, by virtue of the fact that the air-water mix is led into the vertical downward flow 63 while an equally large volume flow can be taken from the vertical upward flow 64, to be led back into the rotating drum.

The partial flow that is removed and is to be led back can, initially, be led to a sedimentation tank, 65. In this case, it is recommended that this partial flow be subjected to a predetermined sojourn period, so that the micro-organisms can be separated from the excess sludge, 71, that is deposited. The flow of fluid that contains the microbes can then be led back to the revolving drum as partial flow 70 while the excess sludge 71 is removed and can be led, possibly, to subsequent processing. The partial flow, 70, can also, initially, be conducted to the preliminary product mixer, 2, and from there, to rotating drum, 6 (see Fig. 6). Furthermore, Fig. 5 shows an additional alternative, which is represented by a broken line of dashes. According to this, the partial flow that is provided for the subsequent aerobic treatment is separated in a microbe separator, 66, into solids, 67, and cloudy water that has been enriched with micro-organisms. Those microbes that are sought for the subsequent aerobic treatment are found in this cloudy water flow, 68.

The cloudy water, 68, that has been enriched with micro-organisms, can now be separated, once again, by way of filter, 69, into water and solids. The liquid phase is now prepared by way of an additional water conditioning facility, 33, in a manner that is friendly to microbes, and then mixed with air in the loop reactor, 59.

Furthermore, Fig. 5 shows that the cloudy water flow, 68, can be brought into a washer, 73, where, if necessary, it is thoroughly mixed together with the partial flow that is branched off behind the rotating drum 6, or with a partial flow from the preliminary decaying that is of equivalent value. A mixing blade, 74, that is arranged in washer, 73, serves this purpose.

The result is then led to a sedimentation tank, 72, in order to remove the solids from the float there. The solids can once again be led to the partial flow, 70. The float is then conducted

to the filter, 69. There, by way of a return line, 167, the thickened solids can be added to partial stream 70.

The water that is filtered out is then led to the water conditioning facility, 33, by way of the filtration water input line, 168, which is, in addition, struck by the recovered heat by way of thermal input line, 15.

By way of supplement in this regard, Fig. 6 illustrates the principle that has been applied thus far, supplemented, however by means of the facility parts I and II.

Facility part I corresponds, in principle, to the anaerobic post-denitrification, as already described in Fig. 1. Facility part I, however, is, in addition, provided for post-denitrification according to Fig. 1, in order to bring the coarse material from sieve 17 to a coarse rot. A return of the sieve residue from sieve 17 to grinder 18 is therefore not needed in this case. What was said according to Fig. 1 regarding all individual structural groups also applies to the parts of the facility according to Fig. 6, I.

In particular, it must still be noted that solids that were left behind in fine sieve 17, by contrast to the line leading back to the grinder 18 according to Fig. 1 - are now led directly to the anaerobe container 19. Therefore, in the portion of the facility according to Fig. 6, I, residual nitrate elimination occurs in the coarse components of the fraction that were filtered out by fine sieve 17, whereas the fine components of the fraction are processed in an identical facility according to Fig. 1. The initial materials on both sides can then, after leaving the facility, be conducted to further use.

Furthermore, Fig. 6 shows, in addition, that in the upper left portion of the picture, the facility's intake is separated into a line, 130, for the input of biologically degradable residual refuse, as well as a line, 130a, for the input of fresh water/utility water. This is mixed with shredded material in a washer, and, if necessary, given up to subsequent water preparation, 35. In each case, partial flows can be taken from the washer, 34, and subsequent water preparation 35, to be led at that time to the preliminary product mixer in the suitable mixture ratio.

This mass flow can, furthermore, still be brought together with a pre-determined proportion of fluid that undergoes biodegradation with difficulty, which is conducted via the line 130b. Mixing fluid containers, 31, whose outlets are then connected to the shared intake line to the preliminary product mixer 2, serve this purpose.

If it should turn out that the flow that is removed from rotating drum 6 requires additional denitrification, it is recommended that a partial flow be taken from behind the grinder, 18, and that it be conducted directly to anaerobic denitrification in the denitrification container 5. This measure makes sense, particularly if renewed thorough mixing of this material with the shredded material, without further denitrification, is to be avoided.

As Fig. 6 also shows, the heat exchanger 13 can be supplied with fresh air via line 130c, without further ado.

Facility part II, according to Fig. 6, shows an additional water preparation. To this end, the partial flow, 55, which is branched off behind the rotating drum, is given over, initially, to a washer, 34, and then to subsequent water preparation, 35, before the partial flow, which is prepared in this way, is then led to the filter 69 in accordance with the representation according to Fig. 5. In this case, as well, a fresh water/utility water flow is led from line 130a to partial flow 55 in the washer 34 before the microbes contained in partial flow 55 can be released by way of the water intake. The resultant solids can then be led back once more to a processing stage ahead of the rotating drum, or be led directly to the rotating drum via the return line 70.

By way of supplementation, it should be said that behind the loop reactor 59, a sedimentation tank, 65, can be provided, the solids of which are also given up to the return line, 70, while the float is led back via the line to the excess water return of the water conditioning facility 33 ahead of the rotating drum.

Figs. 7a, b show additional embodiments of a mixing drum.

Whereas, in the embodiment examples according to Figs. 1 and 6, the mixing drum is seated on bearings so as to be capable of rotation around a horizontal axis, and it has mixing blades, 10 that sit rigidly on its interior wall, by way of deviation from this, Fig. 6a shows that the mixing drum is seated on bearings so as to be stationary. The mixing drum is thus to be regarded as a tank container or something of that sort, in the interior of which preliminary decaying is to occur; this can occur under the additional input of air. The thorough mixing inside the mixing drum is, to be sure, of critical significance to the invention. The thorough mixing is accomplished by means of a circulating conveyor which rolls the material that is to undergo preliminary decaying within the stationary mixing drum continuously, in at least a quasi stationary fashion.

By way of deviation from this, Fig. 7b shows a mixing drum that is also stationary. A mixer, which moves continuously, discontinuously, or in quasi stationary fashion, is arranged within the mixing drum in order to keep the material that is to undergo preliminary decaying in as homogenous a thoroughly mixed state as possible.

Furthermore, Fig. 8 shows yet a further embodiment example of a facility for conditioning water. In principle, what happens here, as well, is that a jet of water is led, in an atomized state, to an electromagnetic field, and is brought together again downstream.

The crucial difference in the case of the facility according to Fig. 8 resides in the fact that the atomization of the water jet, which enters via entry bore hole 37 occurs at a perforated impact plate, 180. The impact plate, 180, has holes, 185, that lie in the extension of entry bore hole 37, which penetrate the impact plate 180 and debouch, in the form of a ring, in the area of the electromagnetic field, in the annular gap, 41, that is there.

The incoming water is shot through the holes 185 and is atomized as it exits the holes. The atomized water is then subjected to the influence of the magnetic field and, downstream, it can, if necessary, be driven through an additional impact plate, 190, before it is collected once more in the outflow channel, 40.

In conclusion, it should be pointed out once more that as a result of the relatively high temperatures that are sought after in the mixing drum, thermal insulation is provided for the mixing drum, which surrounds the mixing drum as an insulating mantle.

List of Reference Symbols

1 Shredder

2 Preliminary product mixer

3 Mixing shaft

4 Mixing blade(s)

5 Anaerobic denitrification container

6 Mixing drum

7 Bearings

8 Input end

9 Removal end

10 Mixing blades, mixing device, mixer, circulating conveyor

11 Return conveyor

12 Return conveyor spiral screw

13 Heat exchanger

14 Waste heat line

15 Thermal return line

16 Coarse sieve

17 Fine sieve

18 Grinder

19 Anaerobe container

20 Drum material return line

21 Anaerobe material return line

22 Crude compost material return line

23 Crude composter

24 Post-denitrification

25 Humus wormer, worm culture

26 Enrichment line

27 Post-ventilator

28 Preliminary ventilator

29 Preliminary denitrification line

30 Water container

31 Mixing fluid container(s)

32 Pump

33 Water conditioning facility

34 Washer(s)

35 Subsequent washwater preparation

36 Housing

37 Entry bore hole

38 Electromagnetic coil

39 Core

40 Outflow channel

41 Annular gap

43 [sic] Point(s) of impingement

44 Radial jet

46 [sic] Mixing blade(s)

47 Mixing surface

48 Mixing hook

49 Undercut

50 Grinder return line

51 Air song nipple [sic] Air suction nipple[4]

55 [sic] Partial flow branched off behind the rotating drum

56 Aerobic subsequent treatment facility

57 Air intake

58 Water intake

59 Reactor vessel

60 Inner vertical tube

61 Loop of flow

[4]Translator's Note: A typographical error in German involving typing "n" instead of "u" would yield this result. It is likely that such an error was made.

62 Aerobic jet

63 Downward flow

64 Upward flow

65 Sedimentation tank

66 Microbe separator(s)

67 Flow of solids

68 Cloudy water flow

69 Filter(s)

70 Partial flow that is led back to the rotating drum

71 Excess sludge

72 Sedimentation tank

73 Washer(s)

74 Mixing blade(s)

130 Residual biodegradable refuse

130a Fresh water/utility water

130b Fluid that undergoes biodegradation with difficulty

130c Fresh air

130d Waste air

167 Return line for thickened solids

168 Filtration water input line

170 Excess water return line

180 Impact plate

185 Hole

190 Impact plate